

THESIS/REPORTS

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FOREST WILDLIFE RELATIONSHIPS IN THE NORTHEAST

Analysis of the

Bureau of Biological Survey Program

at the

Northeastern Forest Experiment Station

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## INTRODUCTION

This analysis shows the underlying conditions affecting comprehensive investigations of forest wildlife relationships in the Northeast. The need and value of such investigation, the size of forest areas in the region and their proximity to centers of population, species of animals to be studied, the correlation of forest and wildlife management, the need for cooperation, agencies concerned with forest wildlife problems, and finally the current work plan, are presented as fundamental considerations. The work plan in many respects is no more than a preliminary survey and a tentative course for action. However, it provides information and a basis for further action for all who are concerned with the proper correlation of wildlife and forest management in New York and New England.

## THE IMPORTANCE OF FOREST WILDLIFE

### IN THE NORTHEAST

The opportunities for public service through proper coordination of forest and wildlife management in the Northeast are outstanding. The population of the component states averages fairly dense, but as Table I shows, it is balanced by large forest area. This condition means there are large numbers of people close at hand to make the most of improved multiple forest use. The people revealed by this table as potential beneficiaries of improved forest use are far from comprising the total. Actually the number is much larger due to travel for recreation from other regions, chiefly the Middle Atlantic and Central States. The Northeastern forest areas thus form a great reservoir of recreational opportunity for millions of people.

The point is important because of modern thought on outdoor life. The values set upon public recreation facilities today leave no doubt that considerable expenditure is justified in increasing their usefulness. Hunting and fishing, splendid forms of recreation inseparably linked with American life, are the favored pastime of citizens from all walks of life. Many others find increased pleasure in forest beauty simply from seeing wildlife in a natural setting. Better hunting and fishing, more abundant wildlife are intimately associated with improved forest uses.

	Population <u>1/</u>		Forested Area <u>2/</u>		Total Area <u>3/</u> (Acres)
	Total	Per sq.mi.	Acres	Per- cent	
Connecticut	1,606,903	333	1,590,000	51.5	3,084,800
Maine	797,423	28	14,507,258	75.8	19,132,800
Massachusetts	4,249,604	528	3,272,487	63.6	5,144,960
New Hampshire	465,293	52	4,501,800	77.9	5,779,840
New York	12,588,066	264	12,017,299	39.4	30,498,560
Rhode Island	687,497	644	279,000	40.9	682,880
Vermont	359,611	39	3,282,000	56.2	5,839,360
TOTAL	20,754,397		39,449,844		70,163,200

1/ Based on 1930 census

2/ Capper Report 1936

3/ Report on Land Planning, National Park Service, 1934.

The trend today is undoubtedly toward placing increased value on wildlife resources. It is perhaps corollary in part to the fact that increasing sums, supporting extensive industries, are being spent each year for outdoor equipment. Apparently, the public is willing to spend additional private funds each year for hunting and fishing. This is likely to be the case for years to come. The sharp increase in hunters and fishermen in the past 25 years has been matched with an abrupt decline in most wildlife populations. The net result until just recently has been an ever-widening gap between supply and demand. One possible result of higher wildlife values is a gradual modifying of commercial forest practices to favor game, especially on lands unable to grow timber rapidly. Accelerated modifications are to be expected when forest administrators see tangible returns from wildlife.

Aside from the industry of supplying sporting goods, and the transporting and housing of hunters and fishermen, there is another important source of revenue from forest wildlife. The fur animals dependent upon woodlands play a part in the great national fur industry. The widespread opinion that fur farms have rendered wild furs unimportant is not supported by fact. Throughout the forested Northeast, thousands of residents benefit from trapping and buying furs. It is a sad commentary on our management of fur resources that they produce so small a portion of the revenue they might. Drained by two decades of gross over-utilization, the fur animals now are but remnants of past numbers.

The question of how to dovetail the many uses of the forest into smooth running administrative procedures is important but the concern of this analysis is restricted to those phases concerned with forestry and wildlife. These relationships have proved to be unexpectedly complex and have made it necessary to study them thoroughly. There is no single line of attack which will give us all we need to know about them.

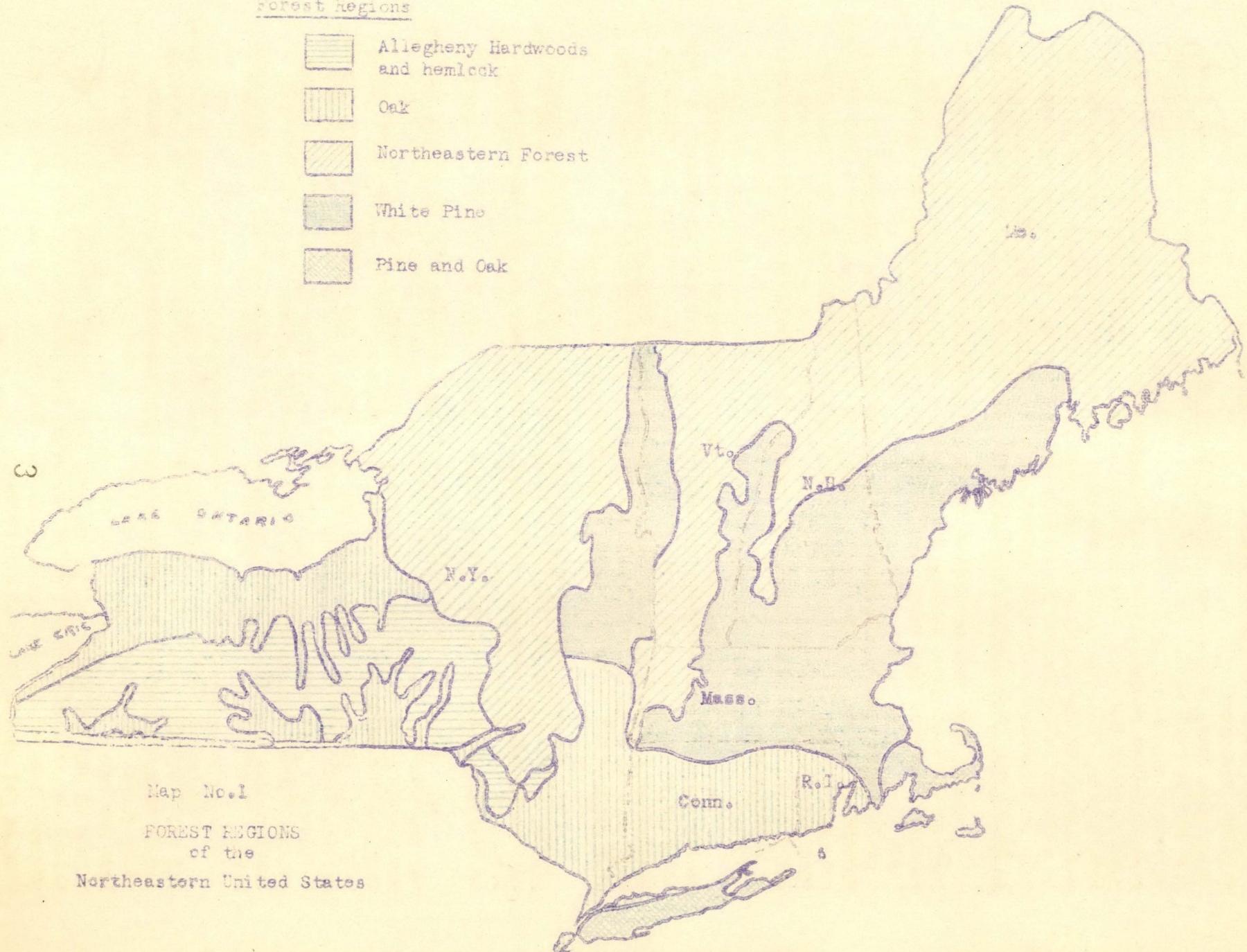
The forested area of New England and New York, for example, contains approximately 40,000,000 acres. This area is composed of several major forest regions (map No.1) each with definite faunal features of its own. These main divisions are broken down into numerous types which also differ in their value as wildlife habitat..

As a whole the Northeastern forest has been subjected to widely different treatments. Less than 5% is now virgin forest. There have been burns and reburns, burns of virgin growth and second growth. There have been cuttings for hardwoods and softwoods, for sawlogs, for pulpwood, and a great many other products. These cuttings were made in old growth, cutover, second growth, and reverted farm fields. In many forests near older urban centers cutting has been done in what might be called third, fourth, and even fifth growth. These various treatments have profound effects on the forest and consequently upon its wildlife population. But the complexity does not stop here.

We have a further confounding of conditions. Insect pests and diseases, and various human uses have also caused changes in the normal plant succession of these forests. The chestnut tree blight particularly, among many other forest tree enemies, has wrought radical changes. Most important, we have man using the forest for not only wood, but recreation, dam sites, rights of way for power and travel, and to a limited extent, grazing. Certainly an amazing list of factors producing and compounding variation in the primeval habitat of our forest wildlife. But the near chaos caused by such varying influences does not end here.

Forest regions

- [Hatched box] Allegheny Hardwoods and hemlock
- [Vertical hatching box] Oak
- [Horizontal hatching box] Northeastern Forest
- [Diagonal hatching box] White Pine
- [No hatching box] Pine and Oak



Map No. 1

FOREST REGIONS  
of the

Northeastern United States

There exists a strictly human confusion regarding administration of these forests and their wildlife. These same forests are wanted for lumber, fuel and pulp, for recreation, for water runoff control, and cover for wildlife. They are handled by numerous administrators motivated by desires ranging from absolute selfishness to the utmost in far-sighted conservation. These administrations are manned by a body of men whose technical knowledge runs in some cases from none whatever, to the best available in others. We have, too, the widespread interest in conservation. This movement has resulted in a powerful body of public opinion, in itself quite diverse and not always adequately informed, that exerts potent and sometimes bewildering pressure on those who administer forests and wildlife.

Out of this seemingly endless list of conflicting interests concerned with Northeastern forests and wildlife difficult problems have arisen. The solving of them cannot be done by any one agency. In fact, the immediate problem in many cases is to reach agreement on which of the various federal, state, and private organizations should best attack a particular problem. In a few cases we have gotten down to the fundamental question of how, after settling who is to do it. Unfortunately, in all too many instances no settlement has been made, and several agencies are embarked toward the same goal in their own way. There is good reason to believe, however, that the machinery of coordinated planning now being set in motion by the federal and state groups will eventually bring order to the situation.

#### FOREST WILDLIFE SPECIES OF THE REGION

The following brief comments on the principal forest wildlife species of the region are intended only to show their general status. The tables give more detailed information on their status in the several states. Even these are not designed to give more than a general idea of how important the different species are at the present time.

For practical purposes the wildlife of this region may be divided into two classes. These are game and non-game animals. Technically, the biologist does not recognize these as two distinct groups. All wildlife is part of a sensitive community. Each year fresh inter-relationships are brought to light which show dependence of animals upon seemingly useless species. Attempts to increase populations of any one kind without due regard for the effects of the proposed program on other animals, or the whole biological environment, lead deeper and deeper into a morass of artificiality. Consequently, the list of species to be considered (table No. 2) is not to be thought of as complete, but rather as the more important species placed according to convenient labels.

Reintroduction of exterminated species may possibly add a few more names to table No. 2. Among such possibilities are caribou, turkey, and fox squirrel. It is unlikely that the wolverine and wolf will ever be brought back. A small band of elk wander wild in southern New Hampshire, but these are exotics originating from western stock. Sound biological principles require that species foreign to the environment generally should be avoided, especially when animals already occupying a nearly similar ecological niche are native to the region. Elk once inhabited sections of southern and western New York, but there is no place there for them now.

Table No. 2.

Occurrence of important Wildlife Species in the Northeastern Forests

Species	State						
	Conn.	Maine	Mass.	N.H.	N.Y.	R.I.	Vt.
Bear		*	x	*	*		*
Beaver	x	*	x	*	*		x
Cottontail	*	x	*	*	*	*	*
Deer	*	*	*	*	*	x	*
Fisher		x		x	x		x
Fox, grey	*		x	*	*	*	x
Fox, red	*	*	*	*	*	*	*
Crouse, ruffed	*	*	*	*	*	x	*
Hare, varying	x	*	*	*	*	x	*
Lynx		x		x	x		x
Marten		x		x	x		x
Mice, meadow	*	x	*	*	*	*	*
Mice, pine	*	x	*	*	*	*	*
Mice, red-backed	x	x	x	x	x	x	x
Mink	*	*	x	*	*	*	*
Moose		*		x			x
Muskrat	*	*	*	*	*	*	*
Otter	x	*	x	x	x	x	x
Porcupine	x	*	x	*	*	*	*
Raccoon	*	x	*	*	*	*	*
Skunk	*	*	*	*	*	*	*
Squirrel, grey	*	x	*	*	*	*	*
Squirrel, red	*	*	*	*	*	x	*
Waterfowl <sup>1/</sup>	*	*	*	x	*	*	*
Weasel	*	x	*	*	*	x	*
Wildcat	x	*	x	x	x	x	x
Woodcock	*	*	*	*	*	*	*

<sup>1/</sup> Black ducks, wood duck's,  
blue-winged teal.

\* - important

x - of lesser importance

An important point not mentioned in each of the tables designating "forest wildlife" is that many of the species are not absolutely dependent upon forest conditions. The category in a strict sense would include only a few animals such as marten, fisher, black bear, and moose -- animals rarely found beyond forest growth. The species listed in the tables inhabit forests to varying extents and are here classed as forest wildlife in order to show the range of species the program of study includes. Likewise, some species will be relatively unimportant in forest wildlife programs, as the cottontail, skunk, shorebirds, and waterfowl. Of the latter group at present, black ducks, green winged teal, and wood ducks are of principal importance. However, a wide field is open for conditioning stopping places in forested areas for a much greater variety of migratory birds.

The bulk of the "sporting industry" in the Northeast rests upon a few game species, chief of which are deer, bear, grouse, rabbits,

pheasants, woodcock, ducks, geese, squirrels, raccoon, and a number of game fish, principally trout, salmon, bass, pickerel, and pike and the so-called "pan fish". It follows then that large sections of the public are very much concerned with the availability of these animals and will on occasion demand these species be given primary consideration on public lands. In planning a regional investigation this possibility must be borne in mind, though not necessarily made the leading consideration. There are the interests of the entire public, and fundamental to all, the welfare of forest and wildlife to remember.

Table No. 3. Game Species of Northeastern Forests

Species	State						
	Conn.	Maine	Mass.	N.H.	N.Y.	R.I.	Vt.
Bear		*	x	* 1/	*		*
Cottontail	*	x	*	*	*	*	*
Deer	* 2/	*	*	*	*	x 2/	*
Fox, red 3/	x	x	*	*	x	x	x
Grouse 4/	*	*	*	*	*	*	*
Hare, varying 4/	x	*	x	*	*	x	*
Moose		* 7/	x 8/				
Squirrel, grey 4/	*	*	*	*	*	*	*
Raccoon	*	*	*	*	*	*	*
Waterfowl 5/	*	*	*	x 6/	*	*	x 6/
Woodcock	*	*	*	*	*	*	*

x - of lesser importance

\* - important

1/ Not considered game legally in New Hampshire, but bear hunting is becoming popular.

2/ Deer not used for sport in Connecticut and Rhode Island.

3/ Fox hunting for sport.

4/ Subject to extreme variations in abundance.

5/ Principally forest species, black duck and blue-winged teal.

6/ Unimportant in some forested areas compared to coast and marsh areas in these states.

7/ No open season now in Maine.

8/ 10 estimated wild in 1938.

Some of the game species mentioned are undoubtedly deserving of very detailed study. They possess attributes leading to high standards of sport, may be developed in numbers, and are native to all forests of this region. The chief of these species are deer and ruffed grouse. The deer population follows fairly regular curves of increase, dependent primarily on cover and weather conditions. Its abundance is closely related to forest practices and conditions. It is the pre-eminent forest species in this region. The ruffed grouse offers less stability. Its numbers fluctuate in, as yet, hardly predictable fashion. For fully half of each population cycle it usually cannot be hunted without loss in capital stock. It is, however, the most important game bird of the region, and is considered foremost in sporting qualities. The outstanding need is a control in the abrupt decline in population. A sacrifice in maximum (peak numbers) would be preferable to

present fluctuations. Since it is primarily a forest bird it becomes one of the most important species to be considered in the present program.

The woodcock is an important species in certain sections of the seven states which benefit from "flight birds" traveling south in migratory concentrations. It can hardly be said that local birds are important in very many sections. This bird is being studied intensively by the Maine Cooperative Research Unit at Moosehorn Migratory Bird Refuge. Waterfowl and shorebirds comprise the remaining native birds hunted for game in the region. Of these only a few kinds of ducks are of regular importance away from the coast. Black duck, blue-winged teal, and wood duck are found breeding on lakes and ponds throughout the region. A few others such as Canada goose and Mallard are found/nesting occasionally, and a number of other species are found in varying abundance during spring and fall migrations. Developments to improve areas for the nesting species will automatically attract many of these.

Moose were formerly indigenous to large areas of the Northeast from which they have been exterminated. This animal is distinctly a wilderness species and may prove objectionable as well as dangerous in mating season if reintroduced in settled areas. This, to date, has been a theoretical danger, as the animal has very promptly been poached out of existence in nearly all cases of reintroduction. However, there are large sections of New York especially, and New Hampshire and limited portions of Vermont, where it probably should be reintroduced and properly protected. Western Massachusetts offers some fine habitat, but it is a question if it is sparsely enough settled.

Elk have been introduced in southern New Hampshire for several years in and about Pillsbury Reservation (Sullivan County). So far the herd has been the cause of relatively little complaint as the animals stick to the pastures and wooded areas. It seems very likely that any great increase in numbers will bring numerous complaints. The fact that the animal is an exotic gives it scant grounds for consideration. Efforts to reestablish moose and caribou on suitable areas of their original ranges in the region are more to the point.

Of rabbits and hares, the cottontails are less of a forest animal than the snowshoe, but both fall within the scope of forest wildlife relationships. Two species of cottontail are found in the region. In point of numbers killed, cottontails are the most important game species in the region. The Connecticut Cooperative Research Unit found them the most popular game animals in that State for rank and file hunters. They are found in all seven States, often becoming very abundant at the peak of a cycle. Snowshoe hares are less important to the public chiefly because they do not occur so frequently near the principal centers of population. They are more of a deep woods species than the cottontail. However, the snowshoe hare is important in the ecology of several fur animals. This role of both rabbits and hares, i.e., that of easing predator kill on other species and contributing to fur value should not be overlooked, condemned though it is by sportsmen. Both animals create difficult reforestation problems, at times, by feeding on young trees.

Only two species of squirrels, the red and the grey are of any great importance in the region. It may be hoped that fox squirrel may one day take its former place. The two flying squirrels, Sabrinus and Glaucomys, have their place in the forest ecology, but it appears relatively insignificant. These beautiful, unobtrusive animals are of keen interest to nature lovers. Neither is a sport providing animal and efforts to popularize their fur would meet with just disapproval from conservationists.

One other group of direct economic value should be emphasized. This is the fur animals given in Table 4. Just what effect the fur farm will ultimately have upon wild fur animal populations is problematical at present. Superior quality and steadier production of pelts from the farms may eventually reduce our wild take to less significant proportions in the fur trade. In the meantime, our fur animals have been severely exploited. In the case of the marten and fisher, they have been over-utilized to the point of extinction over most of the east, and in the case of fox, muskrat, and mink, to a point where they annually yield but a pitiful fraction of their potential value. This condition is deplorable from more viewpoints than that of the conservationist. In the economics of forest communities it is a decided liability. A well managed reservoir of fur producing animals will return more cash to certain key families than any other single supplementary source now open to many of them. Fur income supplements the finances of the fishing and hunting guide, and makes his occupation year around. The value of skilled guides on forested areas, to the public and forester alike, is not always fully realized. Fur income can supplement the cash of other forest workers, help to stabilize the population upon which the forester, in the last analysis, must depend for manual labor. Fur may mean little to a salaried man, but it is the difference between only bare necessities and a few pleasures to many forest families.

Table No. 4

Fur Animals of Northeastern Forests

Species	State						
	Conn.	Maine	Mass.	N.H.	N.Y.	Vt.	R.I.
Beaver	x	*	x	x	*	x	
Fisher		x		x	x	x	
Fox, grey	*	x	x	x	x	x	*
Fox, red	*	*	*	*	*	*	x
Lynx		x		x	x	x	
Marten		x		x	x	x	
Mink	*	*	*	*	*	*	*
Muskrat	*	*	*	*	*	*	*
Otter	x	x	x	x	x	x	x
Raccoon	x	*	*	*	*	*	*
Skunk	*	*	*	*	*	*	*
Weasel	x	*	*	*	*	*	x
Wildcat	x	x	x	x	x	x	x

x - of lesser importance

\* - of importance

Only one species, the undesirable grey fox, is increasing over large areas; the otter is also greatly decimated but is somewhat better off than marten and fisher. Beaver, more plentiful than at the beginning of the century, are still absent from thousands of suitable colony sites. Their populations fluctuate seriously in the states where they are most successful in their comeback, due to excessive trapping in the open seasons. Beaver bring up trying problems on intensively managed forests by their over-zealous dam building and cutting of trees. Nevertheless, aside from pelt value,

beavers definitely increase the wildlife habitat values about their dams and should therefore be encouraged wherever possible.

One reason for neglecting fur revenue is the difficulty of managing several fur animals in harmony with heavy game populations. Maximum numbers of mink and trout, foxes or wildcats, and small game in the same section of forest do not run hand in hand for very long. Compromise provides the answer, especially since we now realize that simply eliminating these predator species will not automatically produce an abundance of their prey.

Some of the fur animals are also hunted for sport. The raccoon and red fox are quasi-game animals. Fox hunting, as practiced in rural New England, is exhilarating, typically American, and well worth preservation. Wildcats are heavily hunted, chiefly for the bounty, and are normally abundant in but very few districts. The animal is probably too well controlled. In common with several other predators, controversy centers around the wildcat as to how much of a factor they have been in reducing game populations.

Certain species, including both game and non-game animals, must be studied in the light of their potentialities for harmful effects on Forests. These are listed in Table 5. Most of this group have high biotic potentials which enable them to become extremely plentiful in very few years if environmental conditions are favorable. Inversely, these same species can fluctuate to low populations as quickly, if not more so, than they attain to high population densities. In reviewing table No. 5 it must be borne in mind that the designations of "important" or "of lesser importance" refers to the state as a whole, but that in any given locality where the animal occurs there is the possibility of sporadic increases changing the local importance. Except in the case of beaver, which may also cause harm with their dams, damage is almost entirely due to feeding activities. It is significant that aside from moose and deer, the animals are all rodents.

#### CORRELATION OF FORESTRY AND WILDLIFE MANAGEMENT

Forest wildlife problems in general came into sharp focus some years ago partly due to the momentum of wildlife restoration movements, due also to several unfortunate cases of over protection for deer and moose, but also because of a new concept in American forestry. The formerly neglected principle that wildlife is a renewable resource of the forest and therefore is within the province of forest management now has been generally accepted by foresters. This acceptance served to emphasize the deplorable lack of data under which we struggle to increase wildlife populations on forested areas. At the critical period it developed that the existing body of knowledge on natural history was inadequate for the formulation of comprehensive wildlife management plans. Gaps existed in the known facts of many life histories at just the points most needed for intelligent planning. The ecology of the forest with animal life fully considered was almost an unknown maze, and the field of quantitative requirements for wildlife species scarcely touched. Such circumstances, coupled with the demand for increased wildlife populations and the conflicts of herbivores feeding on forest growth caused widespread need for practical correlation of wildlife management with other forest uses. The problems arose so swiftly that some confusion still exists as to whether or not wildlife management presents basic conflicts with forest management.

Table No. 5. Wildlife of Potential Economic Detriment to Northeastern Forests

Species	State						
	Conn.	Maine	Mass.	N.H.	N.Y.	R.I.	Vt.
Beaver	x	*	x	*	*	x	x
Cotton-tail	*	*	*	*	*	*	*
Deer	*	*	*	*	*	x	*
Hare	x	*	*	*	*	x	*
Mice	*	*	*	*	*	*	*
Moose		*	-	x	-	-	x
Porcupine	x	*	*	*	*	-	*
Squirrel, gray	x	x	x	x	x	*	x
Squirrel, red	*	*	*	*	*	*	*

x - of lesser importance

\* - important

Much of the present confusion regarding the management of wildlife in harmony with other phases of forestry is due largely to two factors. First, there is incomplete understanding of the effect different wildlife species have on the forest. It is not enough to know that deer eat the young growth of this tree, and neglect that of another. We must know at what population per thousand acres do deer become destructive to favored species, what the safe limit of density, not only of deer but other herbivores, is in the various types of forest. Failure to recognize that such a limit does exist, and damage below it is of little importance, forms the basis of many arguments that wildlife management is incompatible with wood production. The second factor is resistance toward incorporating additional detail into forest management plans. Bothering with game in his plans is as much of a nuisance to the forester particularly interested in growing timber, as trying to produce adequate forest reproduction in an overstocked deer park is to a game technician. Where increased wildlife values have not been definitely set up as a goal, the forester in charge may feel a natural resentment at being saddled with superimposed objectives. This thought brings out the value of properly orienting wildlife phases of forest use in the basic development plans of forest areas whether intended for research, demonstration, or commercial timber growing.

Briefly stated, the most urgent needs of both forest managers and wildlife technicians dealing with Forest wildlife appear to be:

1. An appreciation of each others difficulties; the wildlife technician should not lose sight of the handicaps a forester is under who accepts wildlife administration as a duty when the whole technique of wildlife management is so imperfectly developed; the forester on the other hand should realize the difficulty involved in developing sound technique when the basic biological knowledge on which it must rest is incomplete.
2. A sincerity of purposes in which the forester definitely seeks to place wildlife in its proper status on his forest and the wildlife manager sees wildlife production, except in rare cases,

as a secondary forest product rather than the major objective of forest land management.

3. More adequate knowledge on which correlated management must rest, such as:

- a) improved censusing methods,
- b) better understanding of the ecological relationships between forest animals themselves, and the forest as well,
- c) more complete data on all phases of the life history of each animal to throw more light on food habits, rates of increase and special habitat requirements,
- d) practical methods for reducing forest type values for wildlife to hand-book form,
- e) clarified understanding of how the different forest practices and uses affect wildlife and how wildlife in turn affects the forest uses.

Certain fundamental considerations apply to the philosophy of both foresters and "wildlife" management. In the first place, the American code of sportsmanship demands that forest wildlife be managed with a minimum of artificiality. Forest wildlife is to be maintained as naturally as possible. The significance of this concept is that only normal increases in population are desirable, and these populations must be maintained in a normal manner. In other words, artificial over-stocking and feeding are not to be considered regular wildlife management practices. This entails providing adequate feeding and protective areas by proper rotation of forest cuttings, depending upon ecological succession to provide food and shelter. It is not intended that artificial methods are never to be employed. As temporary practice, a number of useful procedures such as artificial stocking, emergency winter feeding, and strict predator control have their place in building up normal populations while their environment is brought into proper condition.

From what has been stated so far, it is obvious that proper administration of forest and wildlife on the same area is likely to be a complicated activity in the Northeast. There is a great deal to be learned of the effects wildlife has on forests, and the value of different forests and forestry practices for wildlife habitat. Until these effects and values are well known, fine correlation is neither possible nor to be expected. The burden of demonstrating what these effects are and how they apply is squarely on the shoulders of wildlife research in cooperation with foresters.

### NEED FOR COOPERATION

There is no section in the country, of similar size, where the interests of so many different groups converge upon forestry and wildlife. The long list of organizations interested in one or the other is a rather forceful reminder of the need for coordinated effort. Each State, for instance, has its own bureau dealing with wildlife and a separate one for the forests; it also has a State college or university interested to some extent with both resources. In addition there are two national forests, six branch research forests of the Northeastern Forest Experiment Station, two migratory bird refuges under the Biological Survey, a cooperative wildlife research unit in Maine, a wildlife forest experiment station in New York, several soil conservation projects actively involved in woodland wildlife, and several colleges with school forests. All have something at stake in compatibly managed forests and wildlife.

Aside from these public, or semi-public agencies, there is a bewildering number of societies entirely supported by private subscription, which are more or less concerned with forests and wildlife. Some are fundamentally wildlife societies, such as the State Audubon groups, others embrace wildlife within the scope of general conservation activities, or forestry or youth movements. In the aggregate, they represent a large cross section of the public in the region. They form a powerful force for conservation. No program for the region could be sound that did not recognize their importance. It is impossible to become thoroughly acquainted with all the wooded sanctuaries, refuges, and reservations maintained by these groups. Yet each area has its forest wildlife aspects and is therefore a potential area for cooperative activity.

A tentative list of the principal agencies concerned with administration of public forest areas and wildlife for the region and two privately supported universities which have taken a leading part in conservation is given on page 13. The foundations and societies supported by private funds are omitted, leaving only those agencies automatically bound by proper disbursement of public funds to develop programs efficiently coordinated with other public agencies.

There is no lack of existing organizations in which is vested the responsibility for forest wildlife administration and investigation in the various states, but there is some lack of coordination. Actually, the need for effective coordination among the principal agencies and for widespread publicizing of their programs is readily apparent. The means for bringing these two conditions about is less evident, attempts have been made, but few organizations have the active coverage of the whole region. There seems little doubt in the minds of those concerned that an informal meeting of those directing forest and wildlife research or administration in the seven States would be a definite, progressive step, but to date no organization has taken the initiative. The principal purposes of such a conference would be to provide workers in the region with accurate information on what has been done or tried, current investigations, and future plans in view of the outstanding problems facing each agency. While each group will naturally see its own problems paramount, it can weigh them better against a sectional background where the objectives of allied agencies are understood. It is highly desirable that each state under a coordinated land use program, work out for itself at least a tentative scheme for integrating wildlife and various forest uses.

Principal Administrative Agencies Developing Forest or  
Wildlife Areas in the Northeast\*

	<u>Location</u>
<u>Connecticut</u>	
1. Board of Fisheries and Game	Hartford
2. Department of Forestry	"
3. Northeastern Forest Experiment Station	New Haven
4. State College	Storrs
5. Yale School of Forestry	New Haven
<u>Maine</u>	
1. Acadia National Park	Bar Harbor
2. Inland Fisheries and Game Commission	Augusta
3. Maine Forest Service	"
4. University of Maine, Maine Cooperative Research Unit	Orono "
<u>Massachusetts</u>	
1. Division of Fisheries and Game	Boston
2. Division of Forestry	"
3. Harvard University	Cambridge
4. State College	Amherst
5. U. S. Biological Survey (Regional Office)	Boston
<u>New Hampshire</u>	
1. Department of Forests and Recreation	Concord
2. Fish and Game Commission	"
3. University of New Hampshire	Durham
4. White Mountain National Forest	Laconia
<u>New York</u>	
1. Division of Fish and Game	Albany
2. Division of Forests and Waters	"
3. Roosevelt Forest Wildlife Experiment Station	Syracuse
4. State College of Agriculture	Ithaca
5. State College of Forestry	Syracuse
<u>Rhode Island</u>	
1. Division of Fish and Game	Providence
2. Division of Forests, Parks, and Parkways	"
<u>Vermont</u>	
1. Fish and Game Service	Montpelier
2. Forest Service	"
3. Green Mountain National Forest	Rutland

\*This list does not include the U. S. Soil Conservation Service projects in these states which are concerned with farm woodlands and wildlife.

L E G E N D

Name

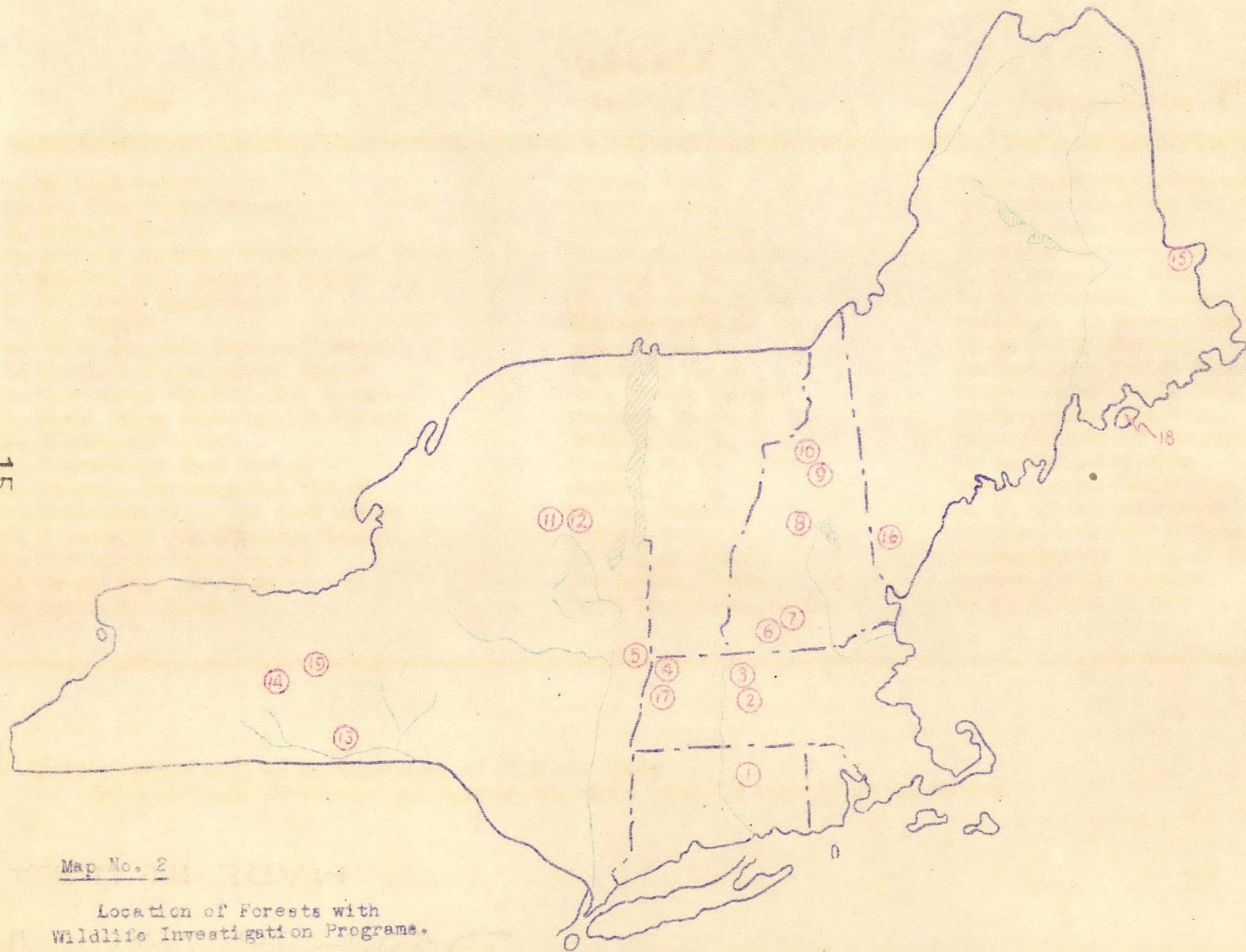
Location

Administration 1/

1. College Forest	Storrs, Conn.	Connecticut State College
2. Mt. Toby State Forest	Amherst, Mass.	Massachusetts State College
3. Harvard Forest	Petersham, Mass.	Harvard University
4. Hopkins Memorial Experimental Forest	Williamstown, Mass.	Northeastern Forest Exp. Station
5. Capitol Hill District Refuge	Berlin, N. Y.	N. Y. Bureau of Game
6. Pillsbury Reservation	Mill Village, N. H.	U. S. Biological Survey (Studies only)
7. Fox Forest	Hillsboro, N. H.	N.H. Dept. of Forests and Recreation
8. White Mountain National Forest	Laconia, N. H.	U. S. Forest Service
9. Bartlett Experimental Forest	Bartlett, N. H.	Northeastern Forest Exp. Station
10. Gale River Experimental Forest	Gale River, N. H.	Northeastern Forest Exp. Station
11. Finch Pruyn Experimental Forest	Newcomb, N. Y.	Northeastern Forest Exp. Station
12. Huntington Forest	Newcomb, N. Y.	State College of Forestry
13. Connecticut Hill Refuge	Ithaca, N. Y.	N. Y. Bureau of Game
14. Chenango Experimental Forest	Smyrna, N. Y.	Northeastern Forest Exp. Station
15. Moosehorn Migratory Bird Refuge	Calais, Maine	U. S. Biological Survey
16. Massabesic Experimental Forest	Alfred, Maine	Northeastern Forest Exp. Station
17. Pittsfield State Forest	South Lee, Mass.	Massachusetts Dept. of Forestry
18. Acadia National Park	Bar Harbor, Maine	National Park Service
19. Pharsalia Refuge	North Pharsalia, N. Y.	N. Y. Bureau of Game

1/ In cooperation with N. H. Department of Fish and Game,  
and Department of Forests and Recreation, which actually administer the tract.

15



Map No. 2

Location of Forests with  
Wildlife Investigation Programs.

with due regard not only of its internal needs but for what neighboring states are doing. Haphazard programs and consequent uncertainty of accomplishments can only result from lack of it. The recent impetus given to wildlife restoration by the Pittman-Robertson Act further serves to emphasize the need for coordinated effort.

One method of obtaining the integrated approach is already in use. The Maine Cooperative Unit at the State University has such a program well underway. These Units supported by state, federal and private funds appear to serve particularly well for coordinating work within the State. Their success in a number of states indicates the value of setting-up a cooperative unit entirely supported by State agencies and private groups within each State. These Units have shown that real progress can be made when State fish and game agencies subsidize the college for accomplishing necessary research specifically designed to solve existing administrative problems.

The Universities and colleges by means of graduate students are in a position to develop knowledge and techniques, especially needed by State departments. This has been done in several cases, but these cases are all too few and most significant, often they are not the result of a permanent, planned unit, but a temporary makeshift arrangement for getting one job done. The most effective field for such projects are the short time problems suitable for Master's or Doctor's degree dissertations. Long range research, which cannot be attacked piece-meal seems to be the logical field for federal agencies. Work of this nature should be based necessarily on careful planning which will harmonize with the various State programs. It logically should be based also on approved plans in order to endure through personnel changes. Plans which represent not what one individual sees as long range problems, but the embodiment of those which have been pronounced desirable by the interested agencies of the region will guard against radically different projects being initiated at the expense of useful work underway when shifts occur in personnel.

#### THE NORTHEASTERN STATION AS A COOPERATIVE AGENCY FOR INVESTIGATING FOREST WILDLIFE RELATIONSHIPS

Since forest wildlife relationships present such complex problems, it can readily be appreciated that the broader ones must be solved by long sustained effort. Considering the Northeast, it was found that very few of the interested agencies have undertaken comprehensive programs to this end. Lack of funds, lack of managed forest area available to agencies interested in the problems and the split responsibility for forest and game in the States appear to be the principal stumbling blocks.

Through provisions of the McNary-McSweeney Act of 1928, the Bureau of Biological Survey is charged with carrying out investigations in forest wildlife relationships. In the Northeast this work is done in cooperation with the Forest Service by a Forest Biologist from the Biological Survey now stationed at the Northeastern Forest Experiment Station, New Haven, Connecticut. His field of operations includes New York and New England. The Station is maintained in cooperation with Yale University. It is considered that the facilities of the Station and close contact with members of the Station Staff should aid in the program of integrated problems to be studied. The opportunity exists for accomplishing a great deal in the study of forest wildlife

under such arrangements provided adequate facilities are made available by the two Bureaus to cope with problems on the scale their importance merits.

Suitable areas for carrying on forest wildlife relationships research are not so abundant as might be supposed. Research on forests already in existence not organized with wildlife relationships as an integral part of the program often offer only limited opportunity. Wildlife research superimposed on existing plans may be makeshift and incomplete. It is not immediately practical in many cases to disrupt previous plans and reorganize objectives to integrate wildlife research, regardless of the desire to cooperate on the part of the forester in charge. There is also the consideration of varying forest types. A greatly simplified program could be drawn up if an area embodying all, or at least the main types to be dealt with were obtainable, but it is a physical impossibility for this region on any area of reasonable size. Therefore, research must be split among several areas where good examples of the forest types exist. The Northeastern Station has such areas in the principal types. Experimental headquarters are located on each of them. These forests are the potential backbone of any type value study and other investigations dependent upon type the Forest Biologist may wish to make. However, it should be recognized that in this region these forests are all either below or close to the minimum satisfactory size for conducting wildlife research as they run less than 2500 acres. Compensations exist for this deficiency in the form of carefully mapped types and numerous sample plots having in most cases detailed history of silvicultural treatment. A final consideration, that can hardly be over-emphasized in a program designed to correlate forest management and wildlife populations is one of actual forest practices existing on the area. Many of the projected studies lose strength unless carried out on areas subject to planned forest management of either a research or commercial nature aimed at practical purposes. This requires areas which are being run according to definite management plans, otherwise "correlation" research is little more than a masquerade. In this respect, forests such as those managed experimentally by the Station have a distinct advantage if correlated wildlife studies are feasible on them.

Placed on a regional basis, unrestricted by State lines, and based upon long time plans, the work of the Forest Biologist may include essential investigations which could hardly be undertaken by the more localized State or university groups. This thought implies development on a broad front rather than investigation in a limited problem. This viewpoint is necessary if the Forest Biologist is to function regionally. In no other way can full cooperation in the seven States be maintained. While such a policy results in less rapid advance on any one problem, a better balanced program is developed from which the project can expand with a minimum of lost motion should more adequate funds permit. The situation is such that vigorous prosecution of minor projects principally on the influence on the forest of different species of animals, enables concrete results to be shown in spite of the relatively slow progress of some of the major problems. In the meantime the groundwork is being prepared for expansion as may be seen from the work plan (page 19).

Cooperation from the Station in the form of clerical help and office space has been a decided assistance in conserving the annual allotment. At present the agreement is to provide 4 half-days of stenographic time a week. The pressure of the work has tended to demand more time than this amount, and the demand will increase as the program develops. If the analysis of field

data is to be kept up to date, and the biologist relieved of certain time consuming fiscal details, a stenographic assistant should be provided for a full 39-hour week. The present allotment set up for the biologist from McNary-McSweeney Act funds is insufficient to supply all of the needed additional half-year of the stenographer's salary to combine with the half already supplied by the Station. Under this arrangement, more time could be devoted to actual field investigation than is now possible for the biologist.

Regarding assistance in the development of projects on the Branch Experimental Forests, there is still the problem of insufficient help. Experience has plainly indicated that one man able to spend at least 25 percent of his time on the work is needed at each of the major Experimental Forests to follow wildlife usage of treated areas properly, and fully carry on other wildlife studies. Until the means are at hand definitely to provide for this additional time with men and until these are of permanent and not temporary status, little can be expected on some of the most important studies in the program, because certain routine observations are needed on at least four of the six forests simultaneously. Experience has very definitely shown that such work must be done by men with training in forestry, and at least training on the job in applied biology. CCC enrollees and local personnel, except in rare cases, are not suitable. Assistant to technician grade has been the minimum satisfactory standard.

#### REVIEW OF BIOLOGICAL SURVEY INVESTIGATIONS AT THE NORTHEASTERN FOREST EXPERIMENT STATION

Since a biologist was first assigned to work with the Station in 1930, decided changes have occurred in the public attitude toward wildlife. Attention is still given, where necessary, to the individual problems of economic importance, formerly the chief line of investigation, but effort is now concentrated on underlying principles for managing wildlife. This trend is well illustrated by the successive projects in which Mr. J. Paul Miller, the former biologist, engaged. Beginning in September 1930, until 1933 his studies were chiefly on the vertebrate enemies of the white pine weevil. Following this work in 1933 came further food habit research work, but of a type indicative of current trends. It included also wildlife food plant treatment studies at Pillsbury Reservation, an area used in cooperative agreement with the Department of Fish and Game and the Department of Forests and Recreation of New Hampshire. These studies developed into Cover Control practices in old field types, second growth thinnings, and wildlife census methods for use in connection with these practices. This work continued until 1936 when C.C.C. camp reductions removed the labor for continuing developments. Miller was transferred to other work in May, 1936. The consequent suspension of activity between then and March 1, 1937, when the present biologist was assigned, broke the continuity of several projects.

In the meantime the need for comprehensive studies and plans for managing forest wildlife had become more certain. An interested public throughout the Northeast had begun requesting aid and advice in handling forests and wildlife together. This need gave rise to the policy which governs the present program of region-wide attention to forest wildlife problems on federal, state, and private areas.

Periodic work, rather than full-time residence, was begun at Pillsbury Reservation to carry on in a lesser degree, the studies started when the Civilian Conservation Corp<sup>help</sup> was available. Food plant treatment studies, grouse cover manipulation, and general observation of the other projects are the chief objectives under the revised set-up. The area is one of considerable interest from a biological standpoint. While not in itself a complete unit, it does have a wide variety of forest condition in or surrounding it. One important point, aside from its interesting variety of wildlife, is that conditions there are typical of much of southern New Hampshire, Vermont, and northern Massachusetts.

Since March 1937, considerable time has been spent in determining problems and conditions throughout New England and New York. This approach was chosen as the best method of developing a regional program. The appended list of projects and problems together with a sample work plan show the nature of the program and the details being worked out to date. Some of the studies are in a state of flux, due partly to the need of assistance in carrying them out, and partly because in some cases they still are in the exploratory stages.

#### WORK PLAN FOR FISCAL YEAR 1939

The appended work plan is based on the problem system whereby each unit of work is a Problem stated in its simplest terms. An outline of the Problem is prepared and a schedule of accomplishment set up for it. The Problem is not continuous, but is closed out by the end of the year with a formal Closure Sheet that summarizes the results obtained. If necessary, a new Problem Outline is drawn for work on the problem in the new year.

The Problem Outlines are work units of the objectives listed in the Project Summaries. The Project Outlines are rather generalized statements of the different phases of work included in the program. These provide orientation and guard against setting up problems unrelated to the purpose of the project. At the same time, the Problem Outlines and Closures are a safeguard against indeterminate research continuing for several years without summarizing results.

Some such system as this is needed when a wide - - - assortment of projects, some of which will have relatively little annual progress made with them can be kept in efficient order. A glance at the type of problems listed in the Project Summaries will indicate how this is done. It will be seen, for example, that many of the Problem Outlines simply call for a plan of future activity. On the other hand, those Projects under which investigations have been made list Problems calling for reports on the actual work.

One important feature of the system is that new developments not foreseen at the beginning of the year are reduced to specific problems and outlined for the Plan as they come along. It requires some effort to do this at first because the development of a new problem often comes so quickly that the worker suddenly finds himself working along without a plan.

In order to keep material pertinent to the projects in one place, a separate folder is set up for each one, and all Problem Outlines, field data, reports and Problem Closures pertaining to it are filed there.

The work plan therefore consists of these three parts:

I. Project Summaries, giving name of each project and list of current problems.

II. Project Outlines, discussing objective and methods of accomplishment.

III. Problem Outlines, work units under each project set up for accomplishment during the current year.

A sample Problem Closure sheet is included on the last page.

WORK PROGRAM

Fiscal Year 1939

PROJECT SUMMARIES

Project A-

The Correlation of Wildlife Management with Forestry  
in the Northeast

Problems for fiscal year 1939:

A-1-39.....Summary of notes for 1939 on the correlation of wildlife management and forestry in the Northeast.

A-2-39.....Study of methods and means for a regional handbook for correlating wildlife management and forestry in the Northeast.

Project B-

Determination of Wildlife Values for Northeastern  
Forest Types

Problems for fiscal year 1939:

B-1-39.....Survey of Station records for location and status of permanent plots in the Northeast.

B-2-39.....Methods of tallying wildlife values on sample plots.

B-3-39.....Plan for determining wildlife values of Northeastern forest types.

Project C-

Forest Plantation and Wildlife Relationships

Problems for fiscal year 1939:

C-1-39.....Establishment report for 1938 shrub plantings.

C-2-39.....Plan and initiate routine examination of 12' x 12' white interplantings at Chenango Forest.

- C-3-39.....Plan and initiate routine examinations of group planting interplantings.
- C-4-39.....Plan April-May 1939 shrub planting program.
- C-5-39.....Use of hydrated lime and cow dung on planted conifers as a deer repellent.
- C-6-39.....Effect of hydrated lime-cow dung used as a deer repellent on young Norway spruce.

Project D-

Establishing a Regional Forest Wildlife Relationship  
Bibliography

Problems for fiscal year 1939:

- D-1-39.....Survey of sources for forest wildlife relationships bibliography for New England available to Northeastern Forest Experiment Station.
- D-2-39.....Plan for compiling forest wildlife relationships bibliography.

Project E-

Survey of Northeastern Forest Tree Characteristics  
Useful to Wildlife Suitable for Genetic Improvement

Problems for fiscal year 1939:

- E-1-39.....Notes made during f.y. 1939 following up 1938 review.
- E-2-39.....Prepare 1938 Survey for Publication.

Project F-

Development of Demonstration Program at Hopkins Memorial Forest.

Problems for fiscal year 1939:

- F-1-39.....Closure of Hopkins Memorial Forest.
- F-2-39.....General program for developing wildlife at Hopkins Memorial Forest.

Project G-

Pillsbury Game Study

Problems for fiscal year 1939:

G-1-39.....Quarterly census of Fletcher Compartment.

G-2-39.....Plant succession in cleared grouse runs.

Project H-

Identifying Wildlife Damage to Northeastern Forest  
Trees.

Problems for fiscal year 1939:

H-1-39.....Photographic file for animal damage manuscript.

H-2-39.....Prepare animal damage manuscript for publication.

Project I-

Experimental Treatment of Wildlife Food Bearing Trees  
and Shrubs.

Problems for fiscal year 1939:

I-1-39.....Mapping location of selected plants.

I-2-39.....Quarterly examination of selected trees.

I-3-39.....Description of selected plants.

Project J-

Relation of Small Mammals to Forest Soils.

Problems for Fiscal year 1939:

J-1-39.....Initiate qualitative study of Gale River Spruce soil mammals.

J-2-39.....Develop permanent plan of work for studying relation of small mammals to forest soils.

Project K-

Cooperation with Station Staff

Problems for Fiscal year 1939:

K-1-39.....Test of squirrel repellents

K-2-39.....Development of a policy statement for  
wildlife on each Branch Forest of the  
Station.

Project L-

Analysis of Biological Survey Program at  
Northeastern Forest Experiment Station.

Problems for fiscal year 1939:

L-1-39.....Complete project analysis.

File  
C

July 1, 1938.

### PROJECT OUTLINE

Title: Forest Plantation and Wildlife Relationships.

Object: To throw light on the effect of prevailing forest planting methods and existing plantations on wildlife populations. The ultimate purpose is to develop methods and types which dovetail with correlated forest and wildlife management.

Scope: This is a long time project of major importance. Investigation will be chiefly in three directions:

1. Size of plantations and arrangement within the plantation.
2. Species planted.
3. Economical interplantings, plantings of wildlife food plants.

Value: The land in need of planting will be enormous for many years to come. Past experience has shown that extensive plantations create acute wildlife problems. Plantations therefore represent an important field of investigation.

Limitations: Present limitations for developing better plantations for wildlife hinge upon cost. The large planting units planted densely, and to timber species alone which are the logical answer to economical reforestation are not desirable from a wildlife standpoint. To find the economical means of creating smaller-sized plantations, of mixed species with suitable wildlife openings, edges, and food species under plantings at comparable cost is the crux of the situation.

Status: In April, 1938, a series of interplantings using several combinations of food bearing shrubs were set out at Chenango Experimental Forest in groups and 12' x 12' plantings of white pine and spruce.

File  
C-1-39

July 1, 1938.

PROBLEM OUTLINE

Title: Establishment report for 1938 shrub plantings. \*

Object: (1) To locate and record species planted,  
(2) to describe purposes of planting,  
(3) state conditions and history of planting.

Scope: Inclusive of all shrub plantings made at Chenango Experimental Forest in 1938.

Value: To complete record.

Methods: (1) Tie plots into located points.  
(2) Describe plantings (include sketch of each plot)  
(3) Photograph each planting.

Schedule: Start July 1, 1938; complete July 31, 1938.

\*Unit of Project C - Forest Plantation and Wildlife Relationships.

File  
C-2-39

July 1, 1938.

PROBLEM OUTLINE

Title: Plan and initiate routine examinations of 12' x 12' white interplantings at Chenango Forest\*.

Object: To set up system of observation and records to show history and wildlife use of shrub interplanting.

Scope: Inclusive of all 1938 planting.

Value: (1) It will keep complete the record for final analysis;  
(2) the Station staff is in need of such a system.

Methods: (1) Direct examination for survival and growth of plants.  
(2) Periodic inspections for wildlife usage.  
(3) Photographs to show rate of development.

Schedule: Start July 1, 1938; complete July 15, 1939.

\*Unit of Project C- Forest Plantation and Wildlife Relationships.

File  
C-3-39

July 1, 1938.

PROBLEM OUTLINE

Title: Plan and initiate routine examinations of group planting interplantings.\*

Object: To set up system of observations and records to show history and wildlife use of shrub interplantings.

Scope: Inclusive of all 1938 planting.

Value: (1) It will keep complete the record for final analysis;  
(2) The Station staff is in need of such a system.

Methods: (1) Direct examination for survival and growth of plants.  
(2) Periodic inspections for wildlife usage.  
(3) Photographs to show rate of development.

Schedule: Start July 1, 1938; complete July 15, 1939.

\*Unit of Project C- Forest Plantation and Wildlife Relationships.

File  
C-4-39

July 1, 1938.

PROBLEM OUTLINE

Title: Plan April-May 1939 shrub planting program.\*

Object: To set up in advance amount, time, and location of shrub plantings on experimental forests in April-May 1939.

Scope: (1) Determine proper experimental design.  
(2) Location of plots.  
(3) Source of stock and labor.

Value: (1) Plan will insure proper layout of work and enable orders for stock and labor to be placed in harmony with other projects on the experimental forests.

Schedule: Start July 15, 1938; complete by February 1, 1939.

\*Unit of Project C - Forest Plantation and Wildlife Relationships.

File  
C-5-39

November 15, 1938.

PROBLEM OUTLINE

Title: Use of hydrated lime and cow dung on planted conifers as a deer repellent.\*

Object: To determine if trees daubed with a 1-4 mixture of lime and dung effectively repels browsing deer.

Scope: Limited this year to a trial demonstration of three plots on Childs-Walcott Estate at Norfolk, Conn.

Value: Should this method prove effective, a cheap control of deer browsing in coniferous plantations will be at hand.

Methods: Three plots of 100 Norway Spruce trees set up as follows:

- 1 plot treated 100% (terminal leader, or leaders in case of interrupted leaders)
- 1 plot treated 50% (every other one)
- 1 plot untreated

Schedule: Plots established November 10-11, 1938; examinations to be made December 15, January 15, February 15, March 15, April 15, by Mr. Siegfried Weiss.

\*Unit of Project C - Forest Plantation and Wildlife Relationships.

File  
C-6-39

November 15, 1938.

PROBLEM OUTLINE

Title: Effect of hydrated lime-cow dung used as deer repellent on young Norway spruce.\*

Object: To determine from examination of the 1939 terminal shoots, whether the deer repellent treatment described in C-5-39 retards growth.

Scope: Limited to growth observations in the three plots used in C-5-39; i.e. 300 plants, 50% treated, 50% untreated, all of the species Picea excelsa.

Value: This check will prove a convenient method of indicating whether the repellent mixture retards growth or produces other apparent harm to the plant.

Methods: Plants to be examined as follows:  
1. Shortly before untreated plants slip their buds in the spring.  
2. Shortly after untreated buds slip.  
3. If treated buds are delayed in expanding daily, as often as necessary to determine length of delay.  
4. June 20  
5. September 20.

\*Unit of Project C - Forest Plantation and Wildlife Relationships.

(S a m p l e S h e e t)

File Data

Date

Problem Closure

Title:

Objective:

Achievement:

Recommendations:

Data and Reports: Location of data, memoranda subjects and dates, including progress memorandum.

<u>Cost</u>	<u>Estimated</u>	<u>Actual</u>
Man days		
technical		
non-technical		
Materials		
Totals	_____	_____

By: \_\_\_\_\_  
(Assignee)